

Patent claims:

1. Method of forming high-molecular polymers starting from gel-forming water-insoluble polymers, in particular polymers of the acrylic type, including the steps of:
  - a) dissolving an amount of at least one initiator-modifier compound in an aqueous solution at a starting temperature;
  - b) adding a gel-forming water insoluble polymer to the solution and mixing it therewith to form macro-aggregates from the polymers; and finally
  - c) modifying the macroaggregates by heating or by irradiation to form water-soluble high-molecular polymers.
2. Method of claim 1, wherein for the modification of the macro-aggregates the temperature of the solution is increased steadily or in intervals from the starting temperature to an elevated aging temperature for a pre-determined time period,
3. Method of claim 1 or 2, further comprising the step of adding a reducing agent to the solution for the removal of excess initiator-modifier compound.
4. Method according to any of claims 1 to 3,, wherein the initiator-modifier compound is of the general formula  $\text{EHaO}$ ,  $\text{EHaO}_2$ ,  $\text{EHaO}_3$  or  $\text{EHaO}_4$  wherein
  - E is hydrogen or an alkali metal or alkali earth metal and
  - Ha is halogen.

5. Method according to any of claims 1 to 4, , wherein the initiator-modifier compound is one of  $\text{CaOCl}_2$ , ozone, peroxide compounds ( $\text{E}_2\text{O}_2$ ) and/or ammonium peroxysulphate.
- 5 6. Method according to any of claims 1 to 5, wherein the initiator-modifier compound is generated 'in situ' by adding precursor compounds or educts for forming 'in situ' substances of the general formula  $\text{EHaO}$ ,  $\text{EHaO}_2$ ,  $\text{EHaO}_3$  or  $\text{EHaO}_4$  wherein  
E is hydrogen or an alkali metal or alkali earth metal and  
10 Ha is halogen.
7. Method according to one of the claims 1 to 6, wherein the concentration of the initiator-modifier compound is determined according to active oxygen.
- 15 8. Method according to claim 7, wherein the concentration (by weight) of the initiator-modifier compound is between 0,05–20,0% of the polymer mass to be modified.
- 20 9. Method according to claim 7 or 8, wherein the concentration of the initiator-modifier compound is between 0.1 and 10%, preferably between 0.3 and 5%, and most preferably between 0.5 and 1.0 % of the polymer mass to be modified.
- 25 10. Method according to one of the claims 1 to 9, wherein the polymer to be modified is in solid form.

11. Method according to claim 10, wherein the polymer is added to the reaction solution in a granulated form.

12. Method according to claim 11, wherein the granulates is composed of particles with a mean diameter of maximum 400  $\mu\text{m}$ , preferably maximum 200  $\mu\text{m}$ , and most preferably maximum 150  $\mu\text{m}$ .

13. Method according to one of the claims 1 to 12, wherein the amount of the alkaline compound for forming the alkaline solution is less than 10% per weight, preferably less than 2%, and most preferably less than 1% per weight

14. Method according to one of the claims 1 to 13, wherein the dissolution of the initiator-modifier compound occurs in a temperature range between 0 and 50 °C, preferably 10 and 40 °C, and most preferably between 15 and 25 °C.

15. Method according to one of the claims 1 to 14, wherein the adding of the polymer is accomplished within 20 minutes, preferably within 15 minutes and most preferably within 10 minutes.

16. Method according to one of the claims 1 to 15, wherein the polymers to be modified are hydrophilic superabsorbents, preferably on the base of acrylic acid.

17. Method according to one of the claims 1 to 16, wherein the concentration of polymer in the reaction mixture is between 0,1% and 50,0% per weight, preferably between 3% and 15%, and most

preferably between 5 and 10% per weight.

18. Method according to one of the claims 1 to 17, wherein the pH of the reaction solution is kept between 5 and 14 and preferably between 7 and 12.

19. Method according to one of the claims 1 to 18, wherein the resulting reaction is aged at an aging temperature of 20 to 50 °C for at least 1 hour, preferably for at least 3 hours, and most preferably for at least 10 hours.

20. Method according to one of the claims 1 to 19, wherein the reaction mixture is irradiated by electromagnetic radiation, preferably daylight, UV-light, penetrating ( $\gamma$ ) and/or X-ray radiation.

21. Method according to one of the claims 1 to 20, wherein the reaction mixture is agitated or stirred vigorously during and after the addition of the gel-forming water insoluble polymer.

22. High molecular mass acrylic polymer obtainable according to one of the claims 1 to 21.

23. Acrylic polymer according to claim 22, wherein the average molecular weight is between  $0.2 \times 10^6$  and  $15 \times 10^6$  a.u.

24. Acrylic polymer according to claim 22 or 23, wherein the polymer is water soluble.